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Red-sided Garter Snake (*Thamnophis sirtalis parietalis*) Relocation and Education Project

Final Report

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Red-sided Garter Snake (*Thamnophis sirtalis parietalis*) Relocation and Education Project

Final Report

Lisa Takats

Alberta Species at Risk Report No. 30

January 2002

Project Partners:

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

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Neil Weldon
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Grade 1 and 2 students from Fort Assiniboine Elementary School.
Members and visitors on Edmonton Natural History Club field trips.

EXECUTIVE SUMMARY

A red-sided garter snake (*Thamnophis sirtalis parietalis*) relocation project was initiated to determine whether snakes would overwinter successfully in another occupied hibernaculum in the Stony Plain area, west of Edmonton, Alberta. A total of 1190 garter snakes were relocated to a den 9.5 km away that contained over 8500 snakes. Thirty percent of the relocated snakes returned to the new den in the following years. None of the relocated snakes returned to their old den site. Size class measurements show the new den to contain a normal distribution of sizes, while the size distribution of relocated snakes was slightly skewed to larger size classes. Growth rates of the resident snakes and the relocated snakes were similar. Overall the project has been very successful, and shows that snakes can be relocated successfully to another occupied den.

Education projects included talks, posters, field trips, media releases, and another snake den management program in Fort Assiniboine. A Snakes of Alberta poster was produced and will also increase public knowledge about snakes and their environments.

1.0 INTRODUCTION

One of the most important habitat components for snakes is the hibernaculum (or den). Snakes are cold-blooded and are therefore sensitive to variations in ambient temperature. Year after year, hundreds and sometimes thousands of snakes migrate to a hibernaculum to spend the winter. Few dens contain over 5000 snakes (Koonz 2001), and can contain more than one species of snake (Gregory 1982, Gregory 1984). These dens are located underground below the frost line where openings occur (tree roots, shale cliffs, rock piles, animal burrows, rock outcrops, pits, fissures, crevices and sinkholes). Snakes also occasionally choose people's cellars and basements, culverts, and old cisterns as overwintering sites. These den sites provide safe, humid places for snakes to spend the winter, where temperatures remain above freezing due to the insulating effects of the ground (Kendell 1998).

There are two major management issues concerning disturbance of hibernacula: 1) if a hibernaculum is destroyed in the winter, entire populations of snakes can be killed; and 2) in the summer, many dens are dug up unknowingly every year by landowners and industry, with undetermined consequences to the snakes. Many dens have been damaged or destroyed by dynamite, oil, fire and bulldozers. As well as destruction of habitat by humans, chemical pollution, commercial trade and periodic natural catastrophes can also cause declines in snake numbers. On the positive side, large dens remaining on private land are frequently protected by landowners.

The red-sided garter snake (*Thamnophis sirtalis parietalis*) is one of three garter snake species that occur in Alberta. The other two species are the plains garter snake (*Thamnophis radix*) and the wandering garter snake (*Thamnophis elegans*). The red-sided garter snake is the most widely distributed species of reptile in North America, and its range extends further north than any other species (Larsen and Gregory 1989). Annual migrations occur in the spring, after breeding has occurred near the den site, and in the fall, to return to the den. Adult females have been shown to move up to 9 km away from a den in Wood Buffalo National Park (Larsen 1987), and up to 17.7 km in Manitoba (Gregory and Stewart 1975). Young-of-year may not return to the den in their first year (Gregory, pers. comm.).

Garter snakes were once considered a common and widespread species across much of their range. Today, the public and biologists are expressing concerns about long-term declines in garter snake numbers and it is recommended that public education in combination with protection of key habitat is important to ensure populations remain stable. In Alberta, all three garter snake species are currently listed as *Sensitive* at the general status level (Alberta Sustainable Resource Development 2001).

The red-sided garter snake is classified as a non-licence species, and is not afforded protection under Alberta's *Wildlife Act*. Hibernacula are protected from disturbance and destruction from September 1 to April 30, under Alberta's *Wildlife Act*, (Alberta Environmental Protection 1996).

The Red-sided Garter Snake Relocation and Education Project was initiated under the Alberta Snake Hibernaculum Inventory in the fall of 1998. Since 1995, the inventory program has collected over 300 records of den sites (of all six species of snakes) throughout Alberta. As more and more den information was collected, an increasing number of concerns were expressed regarding dens which occurred at unsuitable sites and dens that were dug up during winter. Often

snakes and hibernacula that were considered a nuisance, or that occurred on private land and were unwanted, were destroyed. The next step to understanding snake ecology is to track populations at these den sites and to determine how to manage snakes that are unwanted. The objectives for this project were:

1) to relocate red-sided garter snakes from a den north of Stony Plain to another occupied den,
2) to intensively monitor a red-sided garter snake den over a number of years to track populations, age classes, and growth rates, and
3) to inform the public about the importance of snakes in the environment.

An extensive literature search revealed that little work has been conducted on snake translocations (Kendell 1998). Research on snake species that are more charismatic, or whose populations are less abundant than garter snakes and are considered at risk, are more complete. Studies involving translocation attempts and dispersal patterns of the prairie rattlesnake (*Crotalus viridis*) and the blue racer (*Coluber constrictor foxii*) are two examples. Three relocation/hibernaculum construction projects have been attempted in Alberta. The first was by Brian Ilnicki (Ducks Unlimited) and Wayne Roberts (University of Alberta Biological Sciences), however there was no follow up to determine how successful the snakes were in their new den. The second relocation was in the St. Paul area in 2000, when plains garter snakes were moved to an artificial den (Floyd Kunnas, pers. comm.). The third, and most recent initiative in 2001, is a prairie rattlesnake relocation to a newly constructed den in the Lethbridge area (Reg Ernst, pers. comm.).

2.0 STUDY AREA

The two den sites in this relocation study are near Stony Plain and are located 9.5 km apart. Due to the sensitivity of this information no exact locations will be provided. A red-sided garter snake den located next to the post office in the town of Fort Assiniboine was used as part of the education component of the study. Educational field trips, presentations and other events were also conducted around Alberta, but were focused in central Alberta.

3.0 METHODS

3.1 Snake Relocation

In 1998, the Fish and Wildlife Division received a complaint call from landowners about a snake hibernaculum on the front lawn of their property, on an acreage near Stony Plain. The landowners wanted the snakes removed and the decision was made to try to relocate the snakes to another occupied den to determine whether this could be a viable management option. Red-sided garter snakes were hand-captured from the unwanted hibernaculum (lawn site) in September and October 1998, as they returned to the site for overwintering.

All captured snakes were scale-clipped (Blanchard and Finster 1933, Brown and Parker 1976, Ferner 1979) (Figure 1), measured and weighed, and all large snakes (>55 cm snout-vent length) were Passive Integrated Transponder (PIT) tagged (AVID Canada). In amphibian and reptile studies, PIT tags have been used on salamanders, snakes, lizards, crocodilians, freshwater turtles, and sea turtles (Keck and Tuberville 1998). The PIT tag is an electronic tag 10 mm long and 2.1 mm in diameter that can be coded with one of 35 billion unique codes. The tag can be automatically detected and decoded using a scanner. The tags are inserted just under the skin along the dorsal side of the snake. The tag, encapsulated in glass, produces no evidence of infection in tagged animals. Tag numbers used in this study were stored in an Excel spreadsheet and are available through Alberta Sustainable Resource Development, Edmonton.

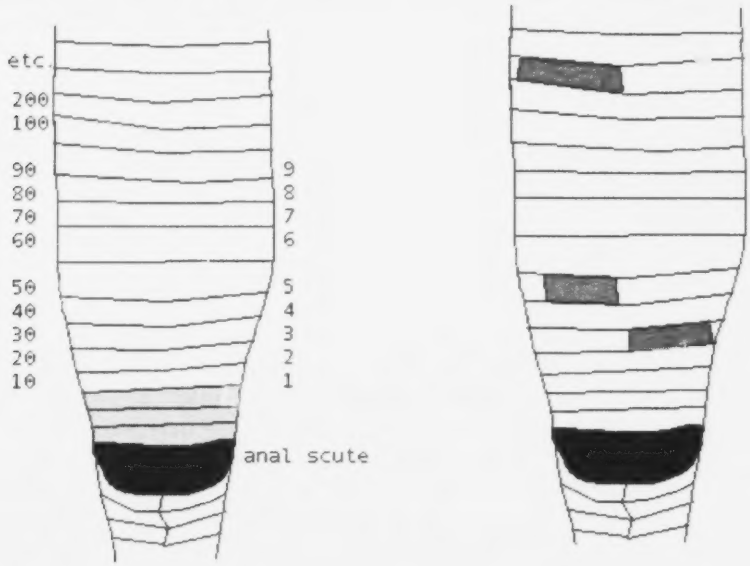

Figure 1. Ventral scale-clip numbering method: left diagram illustrates the numbering system; right diagram shows a sample clip, #242.

Translocated snakes were held temporarily, until they could be measured. Originally the snakes were held in large sinks in a lab at the O.S. Longman Building in Edmonton, however a few snakes escaped into the building. Subsequently, two open-air temporary enclosures were constructed near the occupied hibernaculum that the snakes were being relocated to (Figure 2). One enclosure contained snakes from the new site as well as half the snakes from the lawn site, to determine whether mixing snakes would increase the return rates to the new den.

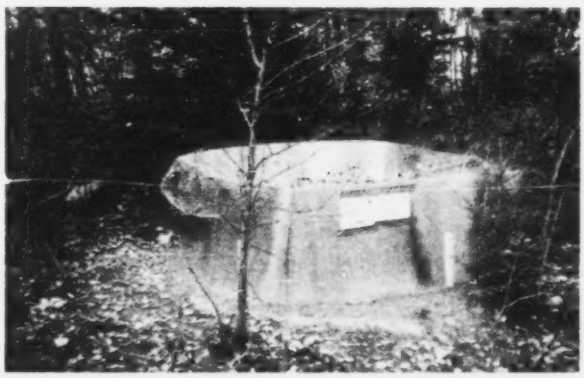

Figure 2. Open-air enclosures at the new site, where snakes were temporarily held for processing.

In April/May and August/September of 1999, more snakes were hand-captured and live-captured using drift fencing and funnel traps (Figure 3) at the lawn site, to increase capture rates. To determine overwinter survival and return rates at the gravel pit den, drift fencing was constructed around the new site and funnel traps were used to catch all snakes leaving the den in spring 1999, 2000, and 2001 and fall 1999 and 2000. Each snake was also checked for scale clips and PIT tags, to determine whether they had overwintered successfully or returned to the new den successfully.

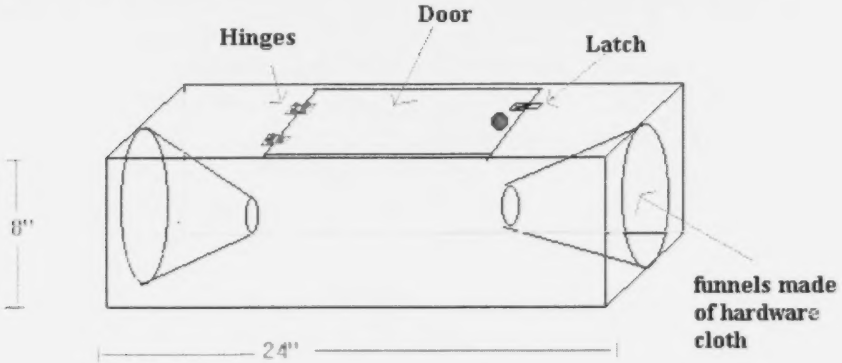

Figure 3. Funnel trap design made with quarter inch plywood.

3.2 Snake Den Monitoring

In April 1999, the gravel pit den was fenced and numbered funnel traps were used to catch and count all snakes that were dispersing from the den site. Traps were set out in the same places each year to determine the direction the snakes were dispersing. A sample of 100 adult snakes were PIT tagged to determine return rates of resident snakes. Counting was not initiated until snakes were congregated along the sides of the fence in large numbers (mid to late May). All snakes were classified in one of six size classes: 0-30, 31-40, 41-50, 51-60, 61-70, and 71+ cm. Snakes were also counted in fall 1999, spring 2000, fall 2000, and spring 2001. A new fence was set up in fall 2000 (hard plastic, similar to that used at the Narcisse snake dens in Manitoba), as the poly-plastic fencing that was originally used needed to be replaced. All data collected from the relocation and monitoring projects were stored electronically in the Biodiversity/Species Observation Database (BSOD) which is maintained by Alberta Sustainable Resource Development. Data was also stored in Excel spreadsheets.

3.3 Public Education

Many techniques were used to inform the public and other researchers about snakes, their management, and their importance in the environment. These included talks, posters, reports, media releases and the production of an educational poster. Field trips were also conducted in cooperation with the Edmonton Natural History Club to the gravel pit den site. The coordinator or staff of the snake program conducted all of these events.

4.0 RESULTS

4.1 Snake Relocation

During the fall of 1998, 282 red-sided garter snakes were relocated with only one fatality occurring during the move (Table 1). Fifty of these snakes were PIT tagged and marked, while the smaller snakes were only scale-clipped. Another 56 dead snakes (killed by a riding lawnmower) were collected at the lawn site. During the spring of 1999, another 341 snakes were relocated (80 were PIT tagged) and in the fall of 1999, 567 more snakes were moved (75 were PIT tagged). No more snakes were found in the spring of 2000 at the lawn site (the den entrance holes had been filled the previous fall) (Table 2). Altogether, 1190 snakes were moved from the lawn site to the gravel pit site. Seven fatalities occurred in traps when temperatures became cold in the fall.

Table 1. Number of snakes relocated and number of snakes PIT tagged.

Date	Number Relocated and Scale-clipped	Number of Relocated Snakes PIT Tagged	Number PIT Tagged From New Den
Fall 1998	282	50	0
Spring 1999	341	80	40
Fall 1999	567	75	5
Spring 2000	0	0	55
Total	1190	205	100

Table 2. Timing of sightings of snakes at lawn site.

Season	Fence in Place	First Snake Sighting	Last Snake Sighting
Spring 1998	No	April 29	May 30
Fall 1998	No	August 17	September 29
Spring 1999	April 20	April 30	June 2
Fall 1999	August 15	August 18	October 3
Spring 2000	April 22	April 25	June 4
Fall 2000	No	None	None
Spring 2001	No	None	None

The smallest and largest snakes captured and relocated were 18.5 and 99.0 cm (total length), respectively. The average snout-vent length was 41.5 cm (S.D. ± 11.1 cm), and the average total length was 52.8 cm (S.D. ± 13.3 cm). Size classes of relocated snakes were skewed slightly to the larger sizes, with the 51-60 cm size class having the largest number of snakes (Figure 4).

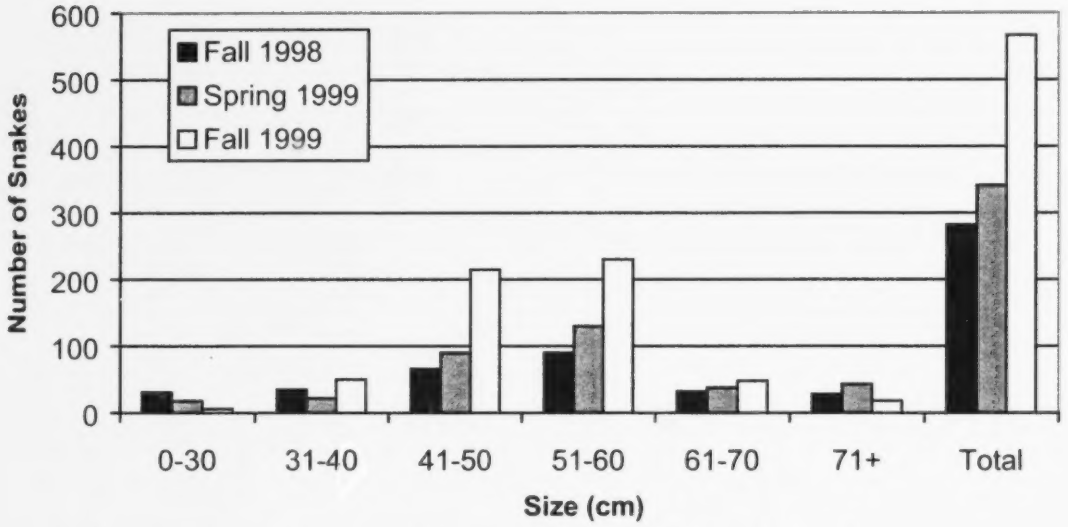

Figure 4. Size classes of relocated snakes in each season they were captured.

Of the 282 snakes that were relocated in the fall 1998, 279 were recaptured in the spring of 1999 as they dispersed from the new den. Thirty percent (n=357) of all snakes that were relocated from the lawn site were recaptured in spring 2000. The snakes that were held in the open air enclosures with snakes from the gravel pit site did not have a higher return rate than snakes that were not mixed. Six snakes grew an average of 7.92 cm from fall 1998 through spring 2001 (range of 4.5 to 10.0 cm) (Figure 5). Relocated females were also observed to be reproducing successfully, as cloacal plugs were observed in many of them.

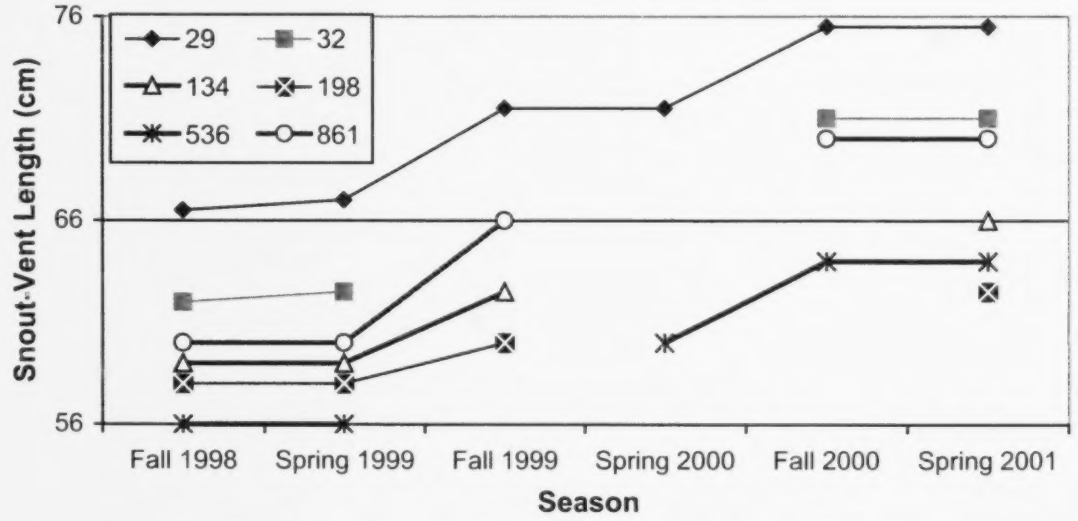

Figure 5. Growth rates of some of the relocated snakes, listed by scale clip number.

4.2 Snake Den Monitoring

Snakes at the gravel pit den were also counted. Counting and releasing snakes over the fences began in May and finished in early June for the spring, while fall counting began in August and finished in October (Table 3). In the spring of 1999 the population was estimated at 3025 (not including the relocated snakes). The highest count was in the fall of 1999 when 8980 snakes were recorded, however, it was determined that a few of the larger snakes escaped over the drift fencing and were double-counted. Over the five seasons of counting dispersing and returning snakes, the numbers were most consistent in fall 1999, spring 2000, and spring 2001. The greatest number of snakes occurred in the 41-50 cm total length range (Figure 6).

In the fall of 2000, new fencing was used, as the plastic fencing was too damaged by wind to repair. However, the fencing was put up quite late, which made determining a population estimate difficult as some snakes had already returned to the den.

Table 3. Timing of counts of snakes at gravel pit site.

Season	Fence in Place	First Snake Sighting	Start of Trapping	End of Trapping
Fall 1998	No	August 17	N/A	N/A
Spring 1999	May 5	April 30	May 20	June 3
Fall 1999	August 5	August 10	August 20	October 1
Spring 2000	April 22	April 28	May 18	June 3
Fall 2000	August 20	August 15	September 17	October 8
Spring 2001	April 20	April 24	May 11	June 1

Other species of animals captured in the funnel traps included: large numbers of grasshoppers, a wood frog (*Rana sylvatica*), three shrews (*Sorex* spp.), four jumping mice (*Zapus* spp.), two deer mice (*Peromyscus maniculatus*), a red-backed vole (*Clethrionomys gapperi*), a least weasel (*Mustela nivalis*), a white-throated sparrow (*Zonotrichia albicollis*), and a dark-eyed junco (*Junco hyemalis*). Predators in the area included a great horned owl (*Bubo virginianus*) and a red-tailed hawk (*Buteo jamaicensus*) that were frequently seen.

Four snakes were found preyed upon throughout the study, and it is believed that two other snakes died from cold exposure, in the traps in early October 2000. No predation was observed on snakes outside the traps. Return rates for the resident snakes were 32% in fall of 1999 and 33% in fall of 2000. Growth rates ranged from 3.0 to 10.0 cm with an average of 7.08 cm (Figure 7).

During spring dispersal, most of the garter snakes moved towards the west, in the direction of Kilini Creek.

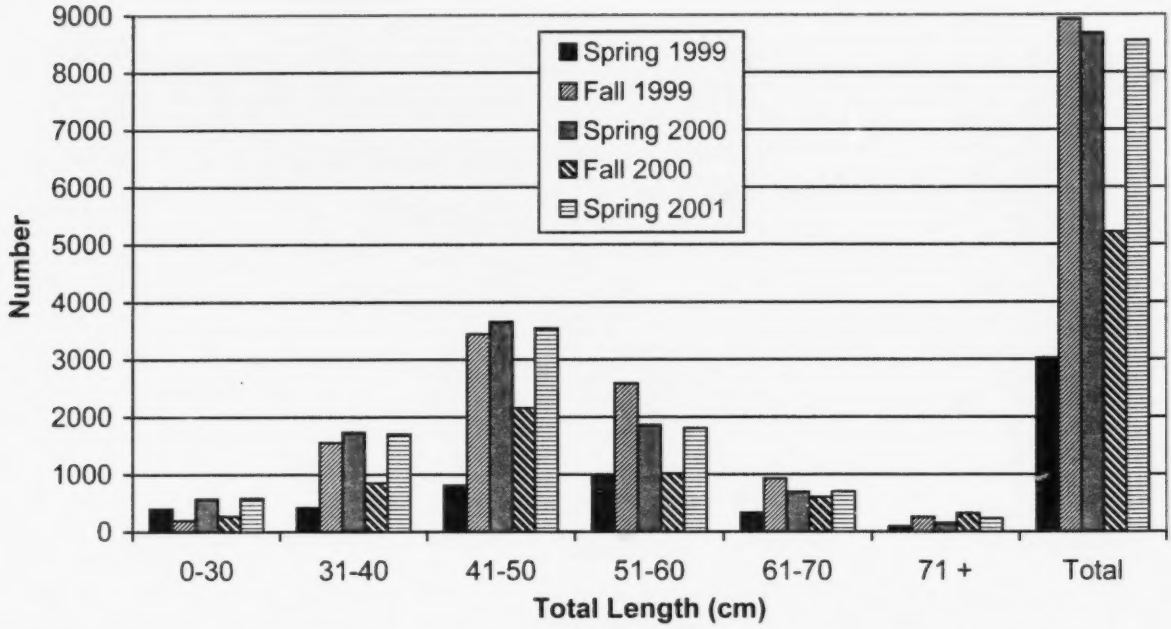

Figure 6. Number of snakes in each size class at the gravel pit site, in the spring and fall of 1999 and 2000, and spring 2001.

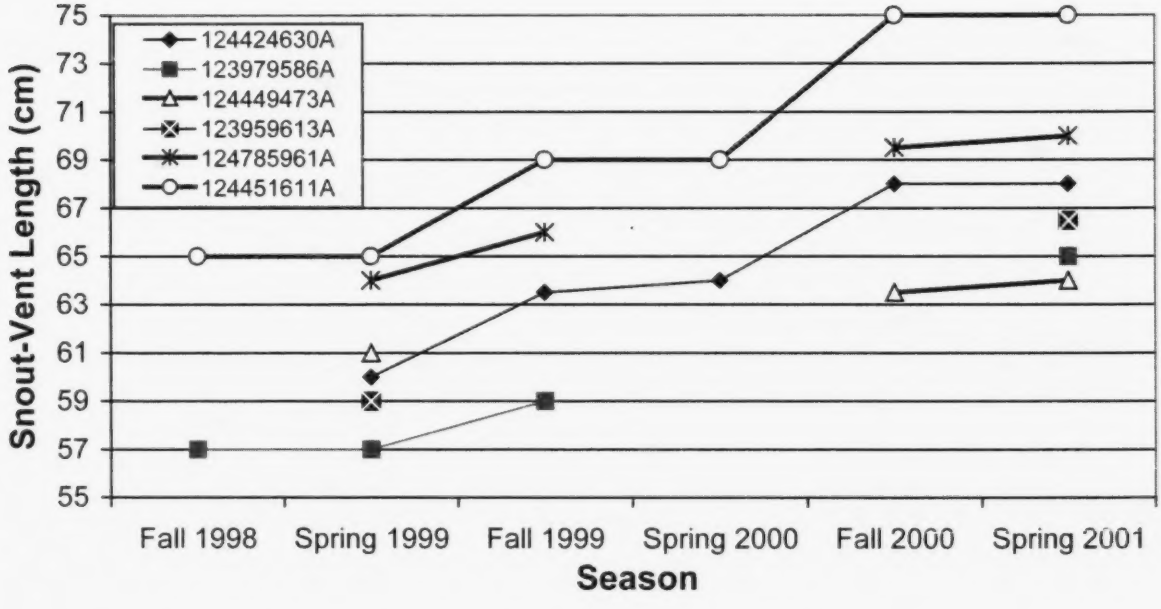

Figure 7. Growth rates of red-sided garter snakes from the pit site, listed by PIT tag number.

4.3 Public Education

Many talks were given throughout the duration of this project. As well, a number of field trips were organized through the Edmonton Natural History Club to visit the snake den at the new site and learn about snakes and the study being conducted (number of people is in brackets).

Talks, Posters, and Field Trips
In 1999-2000:

May 15 – Talk at Pigeon Lake Provincial Park to Natural Area Stewards/Campground Hosts. (48)
May 19 – Talk to Friends of Fish Creek Provincial Park. (23)
July 17 – Booth set up at Parks Day at Fish Creek Provincial Park, Calgary. (123)
August 7 – Talk at Miquelon Lake Provincial Park. (129)
August 28 – Set up booth at wildlife fair for Michener Park. (56)
September 18 – Meeting with biologist from Wood Buffalo National Park re: snake monitoring. (5)
September 21-28 – While on trip to Manitoba met with NRS staff there to talk about snake work. (4)
March 19-21 – " Managing Snakes" talk at Alberta Chapter of the Wildlife Society conference. (49)

In 2000-2001:

April 29-30 – Snow Goose Festival – mentioned relocation project to groups being led on tours. (95)
May 9 – Talk to different elementary grades at Fort Assiniboine school about snakes. (67)
May 14 – Mother's Day field trip to the snake den (through the Edmonton Natural History Club). (62)
July 15 – Parks Day at Lesser Slave Lake – talk about amphibians and reptiles, and the projects under the Alberta Amphibian and Reptile Monitoring Program. (81)
August 5 – Miquelon Lake Provincial Park – formal slide talk to campground visitors. (102)
September 14 – Talk at Valley Zoo on snakes. (17)
September 16 – Field trip to Stony Plain snake dens. (45)
March 1 – Talk at Canadian Wildlife Service about amphibian and reptile projects. (35)
March 15 – Release of the new Snakes of Alberta poster (Figure 8).
March 29 – Alberta Ecotrust Foundation Annual General Meeting in Calgary. (98)

In 2001-2002:

April 11 – Wildlife Week, lunch box session on snakes of Alberta. (19)
May 13 – Field trip to the snake den (through the Edmonton Natural History Club). (60)
May 15 – Field trip for Sustainable Resource Development staff. (14)
June 30 – Talk at Sir Winston Churchill Provincial Park on amphibians and reptiles. (39)
July 6 – Talk at Saskatoon Island Provincial Park on reptiles. (25)
August 18 – Miquelon Lake Provincial Park talk on amphibians and reptiles. (78)
September 11 – Poster presented at the Edmonton Natural History Club conference on Urban Conservation. (135)

November 8 – Talk to Killarney Junior High school students on monitoring programs, including snakes, amphibians, owls, and birds. (137)
November 28 – Talk for the Alberta Society of Professional Biologists lunch time meeting, including consultants from various companies. (61)
December 7 – Talk to outfitters class at Lakeland College in Vermilion. (43)
December 13 – Talk to River Glen School students on reptiles. (167)
January 9 – Talk to Willow Park school, Leduc students on monitoring herpetiles. (73)

Close to 1900 people were informed about snakes, their importance, biology, and conservation.

Figure 8. The Snakes of Alberta poster, presented at a field trip to the snake den, spring 2001.

Scientific Talks
September 21-24, 2000 – Canadian Amphibian and Reptile Conservation Network (CARCNET) meeting in Penticton, B.C. – presented poster on snake relocation study (Appendix A).

February 22-25, 2001 –Talk on snakes, monitoring and management, at Prairie Conservation Endangered Species Conference in Winnipeg.

October 19, 2001 – Talk at CARCNET meeting in Charlottetown, PEI

Snake Den Recovery
Another small project was taken on to help some red-sided garter snakes that were trapped inside their den. The Fort Assiniboine snake den, located in town across from the post office, had been covered over with soil during the winter. This project involved the students of Fort Assiniboine school helping to uncover the snake den carefully (Figure B3). This project was successful, as over 50 snakes made their way out of the cleared den holes. The students have agreed to keep care of the den and to count the snakes each year.

Reports
Three reports have also resulted from this project:

Kendell, K. 1998. Red-sided garter snake (*Thamnophis sirtalis parietalis*) literature review. Report to Alberta Environmental Protection, Fisheries and Wildlife Management Division, Edmonton, Alberta. 28 pp.

Takats, L., and D. Birn. 1999. Herp research is hopping at AENV/ACA. Edmonton Naturalist 27(2): 9-12.

Takats, L. 2000. Red-sided Garter Snake (*Thamnophis sirtalis parietalis*) Relocation and Education Project 2000-2001 Annual Report. Alberta Species At Risk Internal Report, Alberta Sustainable Resource Development, Edmonton, Alberta. 9 pp.

5.0 DISCUSSION

The relocation study was successful overall. Fidelity of snakes to a den has been estimated to be in the 90-100% range (Gregory 1977, Gregory 1982, Parker and Brown 1980); however, others have found it to be considerably lower (Noble and Clausen 1936). We found a return rate of 32.5% for the resident snakes, suggesting that there may be another den in the area. Another den was found in spring 2001 on the ridge east of the main den site, however, only one tagged snake was observed there. The return rate of the relocated snakes to the new den was comparable at 30%.

Snake numbers were much higher than anticipated. Most aggregations of snakes consist of a few hundred, although large dens are also found (up to 8000 snakes at a single den in Narcisse, Manitoba) (Gregory 1984). The count of over 8900 snakes in the spring of 2000 was not expected, as the landowner had estimated that there were only a few thousand snakes on his land. Even the lawn site (from which the snakes were relocated) had four times the number of snakes that the landowners had estimated. The gravel pit site is the largest snake den known in Alberta.

A normal distribution of the size classes was expected. The resident snakes had a normal size class distribution, while the relocated snake size distribution was skewed to larger individuals. Few young snakes were recorded, but Gregory and Stewart (1975) found that young snakes do not return to the hibernaculum their first year, and can overwinter elsewhere. It is thought that it is energetically expensive to return the full distance in the first year (garter snakes can migrate up to 12 km or more). Growth rates for resident and relocated snakes were also comparable.

Another interesting finding was the length of time that the garter snakes spend at the den site. The timing of emergence, dispersal and congregation depends on temperature, latitude and other variables (Gregory 1984). Presently, snake dens are protected in Alberta from September 1 through April 30; however, the garter snakes were found to stay and breed around the den through the beginning of June, and began returning as early as August 10.

Marking methods were fairly successful. PIT tags were the most effective tool for long-term monitoring. Scale clipping did not work well with the young snakes, as they molted the markings off within a year or two. Older individuals kept clip markings through the duration of the study.

6.0 MANAGEMENT IMPLICATIONS AND FUTURE DIRECTIONS

Recruitment for the red-sided garter snake is extremely slow. They do not breed for at least 3 years and likely breed every other year after that. First broods are seldom more than 1-5 young. Approximately 80% of the young do not survive their first winter and 50% of each year class dies annually thereafter. Adult females (over 80 cm) are vital to the well-being of all populations. These females produce as many as 40 young each at least every other year. A snake population cannot increase without a major component of adult females.

Management plans should include the following components in order to protect garter snake populations:

1. Because garter snake populations vary year to year at a den site, monitoring must be conducted each year for a minimum of 10 years to determine population size and trends.

2. When a den is in an unsuitable location, management options can include: blocking the entrance to the hole when the snakes leave the den in the spring; relocating snakes to another occupied den; or relocating to an artificially built den. Effectiveness of artificial dens is currently being studied.

3. Protection of den sites during the time the snakes are present is critical. This would necessitate changing Alberta's *Wildlife Act* to protect dens from August 15 through June 1.

4. Full protection on key den sites will ensure that large populations of snakes remain.

5. Education of the public is essential. As the public learns about the importance of snakes in the environment, they will be less willing to destroy or damage dens or snakes.

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Appendix A. Photographs of the two den sites near Stony Plain, where the relocation study was conducted.

Figure A1. The lawn site that the snakes were captured and moved from (photo by L. Takats).

Figure A2. The gravel pit site where the snakes were relocated to (photo by L. Takats).

Appendix B. Photographs of public education initiatives.

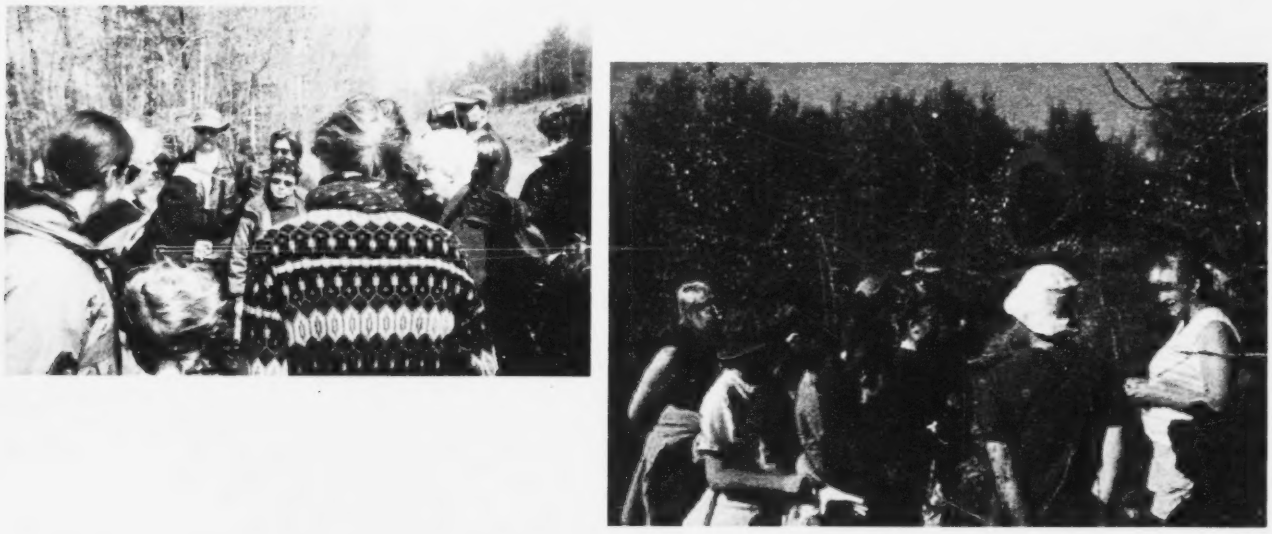

Figure B1. Field trips for Edmonton Natural History Club (photos by C. Priestley).

Figure B2. Poster presented at CARCNET meeting (September 21-24, 2000, in Penticton), author speaking with Karl Larsen, another snake researcher from University College of the Cariboo, Kamloops, B.C.

Figure B3. Photo of the author with students from Fort Assiniboine School who helped uncover the snake den (photo by Melanie Ostopowich).

Figure B4. Photos of home schoolers helping out at snake den (photos by L. Takats).

Appendix C. Photographs of volunteers helping with different aspects of the study, and of snakes at the den.

Steve Brechtel and Margo Pybus.

Chuck Priestley

Doug Culbert

↑ Edmonton Natural History Club volunteer.

→ Dawn Birn showing child how to hold a snake.

← Field trip for Government staff.

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